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# NITRATE NUMBER ONE









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THE J. G. WHITE ENGINEERING CORPORATION  
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ASSOCIATE  
THE ENGINEERS CORPORATION  
NEW YORK



POWER PLANT



## FOREWORD



THE design and construction of one of the important industrial projects involved in America's gigantic war program is briefly described and illustrated in the following pages.

The complete organization of The J. G. White Engineering Corporation and its broad experience in industrial engineering and construction fields, made possible the speedy and satisfactory completion of this undertaking.

White Engineering Corporation service is comprehensive, embracing engineering investigations and reports; designing and construction work of every nature; also the purchase of apparatus, materials and supplies on the most advantageous terms.

Our staff is available at all times for consultation.

THE J. G. WHITE ENGINEERING CORPORATION



POWER PLANT - REAR VIEW



POWER PLANT - TURBINE ROOM

## NITRATE NUMBER ONE

BACK in 1917 no one in the little town of Sheffield, Alabama, was paying much attention to the Republic of Chile. The quiet town was watching one day follow another and going about its placid business. The Tennessee River was flowing evenly past as it flowed long before there was any Sheffield; before there was any Kaiser; before there was any war. Boys from Sheffield were going away to the army as they were from every town in the nation, and the destructive trend of war was, of course, brought home to Sheffield but the community was inland, off the main track of troop travel, out of the panorama of war preparation, and the remoteness of the Republic of Chile and the possibility of Sheffield's going to war as a town never entered the mind of a single citizen.

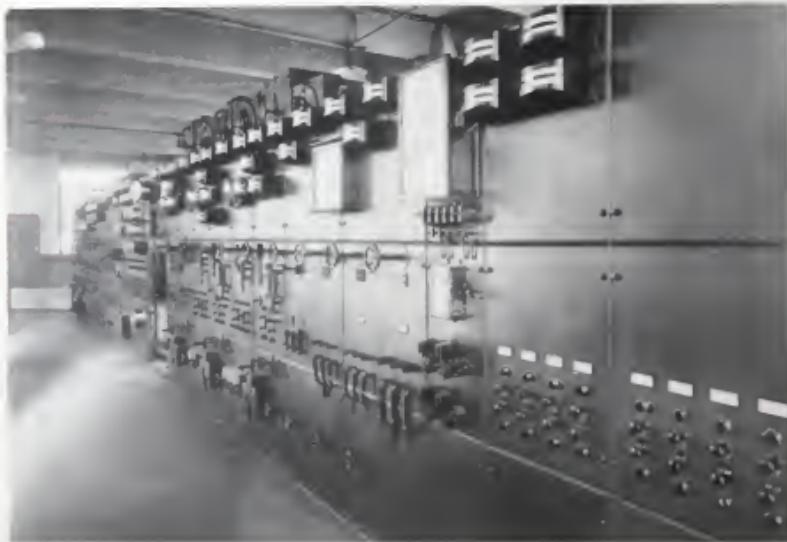
One day rumor set the town afire. The Government, it seemed, needed enormous quantities of explosives. To make them it needed nitrates. There were plenty of nitrates in the Republic of Chile, but our army and its supplies had to have every single ton of shipping space for Atlantic transport. No ships could be spared to bring the precious nitrates from the west coast of South America.

The United States Government, spurred by our prodigious war requirements, had been investigating processes for the fixation of atmospheric nitrogen as ammonia, and then converting it into nitric acid and other bases of explosives. The Nitrate Commission of the War Department had decided to introduce at once the General Chemical Company's synthetic ammonia process. What was more, the Government must build a plant for the process, and that plant must supply 60,000 pounds of ammonia per day, and have facilities for converting part of this ammonia into weak nitric acid, a small portion of which was to be concentrated, and the balance used with the ammonia not converted, for the production of ammonium nitrate.

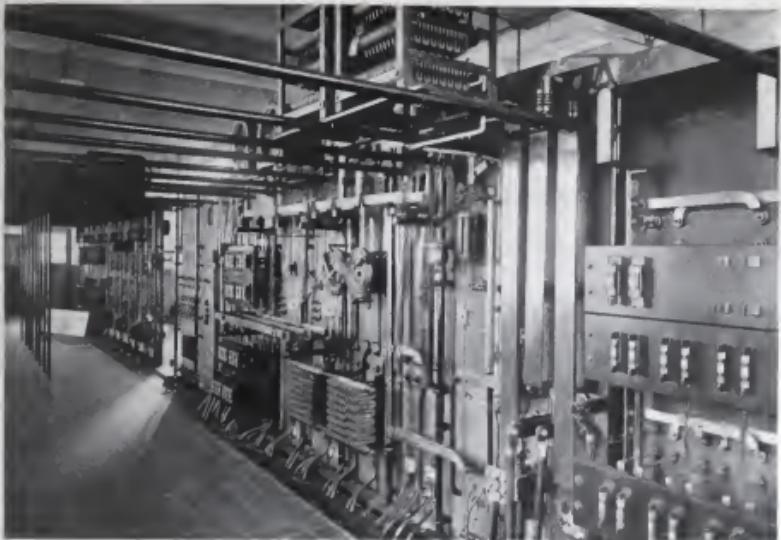
Sheffield had a great river and a good factory site, and the government, so ran the rumor, was going to put up the plant there, right in the town. You can picture what that rumor did to the inhabitants. The rumor, however, developed to be a fact, and amazing changes came over the little town at once.



POWER PLANT TURBINE ROOM, SHOWING ELECTRICAL EQUIPMENT



POWER PLANT - CONTROL SWITCHBOARD, FRONT VIEW



POWER PLANT—CONTROL SWITCHBOARD, REAR VIEW

The United States Government, in 1917, engaged The J. G. White Engineering Corporation to do the engineering and construction work. This entailed not only the planning and erection of the new buildings for this vast industrial unit, including the remodeling of the buildings already on the site, but also the surveying and building of a brand new town alongside Sheffield to house the army officers and men who were to operate the plant. The normal population of 5,000, white and black, was suddenly swollen by the mobilization there of a great force of workmen who were to be engaged on the construction work. A camp for white labor was so arranged that it would later fit easily into the established community. It was designed to include a thoroughly modern water supply; sanitary and electric light systems; its streets were laid out for permanence; there were to be concrete residences for the officers in command and comfortable barracks for the non-commissioned officers and men; there was a school house which could be used at night for meetings and entertainments; in fact every living requirement of an established community was analyzed, provided for and built. Off in a pleasant



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#### POWER PLANT

1 and 2—Front and Rear View of D. C. Circuit Breaker Switchboard, 3—Circuit Breakers



POWER PLANT BOILER ROOM

nearby wood more than eighty bunk houses and a mess hall were built for the negro laborers.

It was November of 1917 when the first construction trains with heavy loads of material and machinery began to wake echoes in the Alabama hills. Twelve months later the job was finished. Within the span of a year Nitrate Number One stood ready to produce its product. Following is a brief description of what was built in that twelve months:

**THE GAS PLANT**—The gas plant consists of a gas house with six producers and the necessary auxiliary apparatus, including seals, scrubbers and compressors; a reinforced concrete track hopper; a 100-ton coke bin with a skip hoist; six purifiers, and two gas tanks with a respective capacity of 500,000 cubic feet and 75,000 cubic feet. The blue gas stored in these tanks is conducted into—

**THE AMMONIA PROCESS BUILDING**—Where it is used in the furnaces and the synthetic production of ammonia. The process building is of steel and brick, 225 x 240



**POWER PLANT**

—Top of Boiler    2—Compressor Room; 3—Ash Hoppers and Track; 4—Battery Room



GAS PLANT



SAFETY IN THE OPERATING FLOOR



LIFE PLANT - 1000 T.P.M.



MACHINE SHOP

feet. Its three productive units have a respective daily capacity of 15,000, 15,000 and 30,000 pounds. It is the largest consumer of power in the entire establishment and consequently adjoins—

**THE POWER PLANT**—The building measures 163 x 75 feet, with a height of 81 feet. It houses eight 500 h. p. boilers, complete coal handling equipment, overhead coal bunkers, weighing larry, automatic stokers, forced draft, ash hopper, cars and incidental equipment. The turbine room, served by a 25-ton crane, contains two 1875 k.v.a. bleeder turbines and one 1250 k.v.a. bleeder turbine with condensing equipment; two 1700 k.w. rotary converters; one 1150 k. w. rotary converter and one 35 k.w. exciter. Adjoining the power plant, in turn, are the water softener and cooling pond. In just six months' time this plant was completed and furnishing power.

Those are the main buildings. But taking nitrogen from the air requires more than a process building, a gas plant, and a power plant, even if they are correctly supplied. The synthetic ammonia produced in the process building is carried by a



AMMONIA PROCESS BUILDING



NEUTRALIZATION, OXIDATION AND ABSORPTION; CONCENTRATION BUILDINGS

pipe line to the oxidation and absorption building where it is converted into nitric acid; that, in turn, is conducted to the neutralization building, where weak nitric acid is combined with ammonia to form a solution of ammonium nitrate; this is relayed once more to the ammonium nitrate buildings through an overhead pipe line.

Each of those supplementary structures had to be shrewdly planned and built, and the planning had to anticipate certain freakish obstacles in the process. For example—free acid fumes will attack an unprotected building of almost any material. Accordingly the oxidation and absorption building was constructed of a steel frame, easily accessible in all its parts for protective painting at any time, and the roof and sides were made of corrugated steel sheets, easily replaceable and covered with a thick “skin” of asbestos.

Again, in so precise a chemical process as this, nothing but the cleanest of fresh water would serve, so there was planned and built a filtration plant to pump water from Spring Creek, boost it, filter it, deposit it in a 20,000-gallon tank, and store a reserve in a 200,000-gallon standpipe.



OXIDATION AND ABSORPTION BUILDING



AMMONIA TANKS



CONVERTED PIPE FOUNDRY—USED AS PIPE AND FORGE SHOP, GENERAL STORES, LAUNDRY, ETC.



AMMONIUM NITRATE BUILDING

Again, the final step in the process is dangerous. If it had ever gone far wrong Sheffield would have left the map of Alabama with nothing but wreckage to mark its going. So the buildings for the final step were erected a mile away from the plant proper, and the neutralized acid was carried a mile to be run through evaporating pans into crystallizing kettles. There, finally, the finished product was obtained—crystals of ammonium nitrate.

The J. G. White Engineering Corporation is justifiably proud of having built Nitrate Number One, and made operative the chemistry of the General Chemical Company. Operation did not come while the war was on. Confidence, however, in the plant's potentialities is based on the knowledge that into its planning and construction went not only a quarter-century of engineering experience, and the concerted and intensive work of a well tried organization, but the inspiration and satisfaction of doing a difficult job fast and well for the United States of America.



TYPE OF RESIDENCE



RESIDENCES



OFFICERS' BARRACKS



TYPE OF RESIDENCE



SCHOOL. HOUSE







